Water Management Plan

United States Environmental Protection Agency
Gulf Ecology Division

1 Sabine Island Drive
Gulf Breeze, FL 32561

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EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
GULF ECOLOGY DIVISION LABORATORY

WATER MANAGEMENT PLAN

Approved by:

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1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

In order to meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential to achieve these objectives.

Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity becomes more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy.

EPA recognizes that regional, state, and local differences exist regarding water quality, quantity, and use. Differences in climate, geography, and local requirements influence the water efficiency programs applicable to specific facilities. Therefore, EPA is establishing facility-specific Water Management Plans to promote the efficient use of water and meet the water conservation requirements under Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management.

This Water Management Plan has been established to document and promote the efficient use of water at the EPA, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division (GED) facilities in Gulf Breeze, Florida. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines.

2.0 FACILITY DESCRIPTION

GED conducts research to understand the physical, chemical, and biological dynamics of coastal wetlands and estuaries, to determine ecological condition, evaluate rates and causes of declining systems, and predict future conditions under various alternative water quality scenarios. The Division pursues research under three distinct branches. The Ecosystem Assessment Branch develops and evaluates methods to assess ecosystem condition and monitor long-term change in ecological condition. The Biological Effects and Population Response Branch conducts research and develops methods to asses the effects of multiple and complex stressors on coastal aquatic plants and animals. The Ecosystem Dynamics and Effects Branch evaluates ecological dynamics to determine the effects of environmental stressors in support of ecological criteria development.

Research is conducted on a 17 acre island located just south of Gulf Breeze, Florida. The island is connected to adjoining land by a short causeway. Originally used as a quarantine station by the Federal Government, the oldest structure was built in 1902. Several buildings were built between 1932 and 1942, but the majority of structures were built since 1977. Major buildings, their function, and date of construction are listed in Table 1. The facility has been owned and operated by EPA since 1970.

Table 1. Major GED Laboratory Buildings

Building Number	Function	Year Built
1	EAB Offices	1902
10	Shop Facility	1997
20	Marine Toxicology and Chemistry Laboratory	1979
34	BEPRB Offices	1932
38	EDEB Offices	1932
42	Library	1932
45	Marine Environmental Assessment Laboratory	1980
47/49	Marine Ecology Laboratory	1986/1992
65	Support Office/ Conference Center	2002

Laboratory functions include wet chemistry and marine culture and toxicity testing. In addition to these main buildings, there are numerous other out buildings used for offices space, storage, and other laboratory support functions. All totaled, there are 79,450 square feet of conditioned space at GED.

3.0 FACILITY WATER MANAGEMENT GOALS

The resource conservation goals of GED are achieved through the implementation of an Environmental Management System (EMS). The GED EMS policy statement, as well as objectives and targets related to water consumption, are provided below.

Environmental Management System Policy

The US Environmental Protection Agency's Office of Research and Development (ORD) mission is to perform state-of-the-art research to identify, understand, and solve current and future environmental problems, provide responsive technical support to EPA's mission, integrate the work of ORD's scientific partners (other agencies, nations, private sector organizations, and academia), provide leadership in addressing emerging environmental issues, and advance the science and technology of risk assessment and risk management.

ORD continues to encourage and set an example of research and development activities which use effective environmental management systems (EMS) that focus on regulatory compliance, pollution prevention, resource preservation, and public outreach. With this policy, the National Health and Environmental Effects Research Laboratory – Gulf Ecology Division joins other ORD sites in committing to implement EMS for our own employees, operations, and facilities. Collectively, ORD will become a leader in executing a model environmental management system within the Agency.

At GED, we commit to reduce the environmental impacts and consumption of natural resources from our facility operations and comply with all legal and applicable requirements. Our environmental management system will be designed to meet the following goals:

- Ensure compliance by meeting or exceeding all applicable environmental requirements while conducting research activities;

- Strive to continuously improve environmental performance;

- Integrate source reduction and other pollution prevention approaches into day to day research activities;

- Consider the environment when making all planning, purchasing and operating decisions;

- Establish, track and review specific environmental performance goals and employee awareness; and

- Share performance information with our research partners and other interested parties.

EMS Water Management Objectives and Targets

GED has established the reduction of fresh water use as an objective under the EMS. As a specific target, GED will reduce fresh water use by an average of 2% per year over eight years (Fiscal Years 2008 to 2015) for a total of 16%, using Fiscal Year 2007 as a baseline.

The actions that GED will pursue under the EMS to achieve these objectives include the following:

Cooling Towers. Water chemistry will be maintained at maximum ionic content while preventing calcium buildup in the system. Efforts to reduce heating and cooling demands in buildings with cooling towers will reduce the demand for cooling and reduce water consumption. The facilities manager will investigate opportunities for using alternative cooling technologies (e.g. saltwater) when replacing major HVAC systems.

Miscellaneous Equipment. High efficiency appliances will be installed during repairs and improvements. Researchers and building coordinators will confirm that water conservation is considered in designing and conducting research. Researchers, building coordinators, and staff will report water leaks to the facilities manager for repair.

Dishwashers. Glassware will be consolidated to fill the dishwasher to about 75% before it is turned on.

Autoclaves. Autoclaves will be turned on only when actually in use. Glassware and other material will be consolidated to fill the autoclave to about 75% before use.

GED has established a Water Consumption Advisory Committee that will meet annually to discuss progress toward meeting water consumption objectives and targets and identify other opportunities to conserve water.

4.0 UTILITY INFORMATION

Contact Information

Potable water supply and sewer service are provided by:

Emerald Coast Utilities Authority
Ellyson Industrial Park
9255 Sturdevant Avenue
P.O. Box 18870
Pensacola, FL 32523-8870
850-476-0480

Water Rate Schedule

For water service, GED pays a monthly minimum charge of $295.83 for the first 80,000 gallons and a per unit charge of $2.79 per 1,000 gallons thereafter.

Sewer Rate Schedule

The utility also assesses a monthly minimum charge for sewer service of $270.83 for the first 40,000 gallons and a per unit charge of $4.70 per 1,000 gallons thereafter.

Water and sewer fees described above became effective on October 1, 2006

Payment Office

Vicki Blackmon
Finance Office
US EPA, Gulf Ecology Division
1 Sabine Island Drive
Gulf Breeze, FL 32561

850-934-9306

5.0 FACILITY WATER USE INFORMATION

The GED campus consists of over 30 buildings dedicated to research laboratory activities, office space, storage space, or other support functions. The primary buildings and their function are listed in Section 2.0. The laboratory space is configured to conduct bench-scale research on chemicals and their impact on the environment. Some of the laboratory space is equipped with a seawater delivery system that can deliver seawater with varying salinity for marine life culturing or toxicity testing. The salinity is controlled within this system by blending seawater and fresh (potable) water to achieve the desired concentration. Potable water is used for mechanical systems, sanitary needs, laboratory processes, and fire protection. Additional details on facility water use are provided in the following sections.

Major Water Using Processes

Estimates of potable water consumption by major use area are provided in Table 2. These data reflect average facility water use between April 2006 and March 2007.

Measurement Devices

Incoming water is supplied by Emerald Coast Utilities Authority through a single supply line equipped with a compound high flow – low flow meter. The meter is located in a below grade meter pit at the intersection of Narvaez Drive and Sabine Drive.

Four of the five cooling towers (cooling towers for buildings 45, 47/49, and 65) are equipped with meters on the make-up water lines. The potable water supply line to the outside seawater system is also equipped with a flow totalizing meter. This supply line provides fresh water for salinity control, and weekly washdown of the exterior surfaces of the seawater system. Under this plan, flow data from these meters will be recorded and tracked on a monthly basis. The facilities manager will use these data to monitor trends in water consumption and investigate and resolve unexpected changes.

Shut-off Valves

Main shut-off valves are located in the main meter pit, and also at the south side of Building 42.

Occupancy and Operating Schedules

Approximately 135 people work at the GED facility. The facility operates on a flex time schedule, one shift per day, Monday through Friday.

Table 2. Major Water Using Processes – Potable Water

Major Process	Annual Consumption (gallons)	Percent of Total	Comments
Wet lab – marine culture and marine toxicity testing water (potable water)	70,000	0.6	Engineering estimate
Seawater system washdown	70,000	0.6	Engineering estimate
Fire control system testing	670,000	6.0	Engineering estimate
Sanitary water	510,000	4.5	Engineering estimate
Cooling tower make-up	8,800,000	79.0	Engineering estimate
Miscellaneous laboratory water use	1,023,500	9.2	Calculated by difference from metered total
TOTAL	**11,143,500**	**100**	**Average annual usage based on supplied metered total, April 2006 to March 2007**

Additional detail on assumptions and calculations supporting these water use estimates are provided in Appendix A.

6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS

The President has established Water Reduction Goals under Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management. Under the Executive Order, Agencies must establish a FY 2007 water use baseline, and then reduce water use by 2 percent annually through the end of FY 2015, for a total reduction of 16 percent. Facilities should implement Best Management Practices (BMPs) related to water use, considering life-cycle cost effectiveness, to achieve these water reduction goals. The Federal Energy Management Program (FEMP) has identified BMPs in 10 possible areas to help facilities identify and target water use reductions. GED has adopted and will maintain BMPs in eight of the 10 areas, as checked below:

- ✔ Public Information and Education Programs
- ✔ Distribution System Audits, Leak Detection, and Repair
- ✔ Water-Efficient Landscape
- ✔ Toilets and Urinals
- ☐ Faucets and Showerheads
- ☐ Boiler/Steam Systems
- ✔ Single-Pass Cooling Systems
- ✔ Cooling Tower Systems
- ✔ Miscellaneous High Water-Using Processes
- ✔ Water Reuse and Recycling

Additional information related to each BMP area is provided in the following sections.

Public Information and Education Programs

GED promotes water conservation and awareness through its laboratory EMS implementation. Specific water conservation objectives and targets have been established under the EMS. Water use information is tracked and shared with the staff. Employees have been educated on water and other resource conservation topics through implementation of the EMS. Water conservation is periodically addressed in the Greening GED newsletter. A Water Consumption Advisory Committee meets annually to discuss progress toward meeting water consumption objectives and targets and to identify aditional opportunities to conserve water.

Distribution System Audits, Leak Detection, and Repair

Facility staff are trained to report leaks and malfunctioning water-using equipment to the facilities manager. Reported maintenance problems are assigned a work order, which is completed promptly by the O&M staff. Work orders are tracked until the job is completed and the work request closed out. In addition, O&M staff perform a visual inspection of core building and mechanical spaces each morning. Any leaks or other mechanical problems are corrected promptly. Janitors and security guards also are trained to report any observed problems to the facilities manager or O&M staff.

A screening level system review was conducted in June 2007 and known water uses account for over 90% of water consumption.

Under this plan, trends in monthly water use also will be monitored by the facilities manager and changes that are not understood or expected will be investigated and resolved.

Water-Efficient Landscape

No landscape irrigation water is used at GED. Grasses and shrubs are climate appropriate and make use of natural rainfall.

Toilets and Urinals

Toilets and urinals throughout the GED facilities have either been installed new, or updated to be compliant with 1992 Energy Policy Act (EPAct) water efficiency requirements (1.6 gallons per flush for toilets and 1.0 gallons per flush for urinals). An inventory of sanitary fixtures is provided in Table 3.

Table 3. GED, Inventory of Sanitary Fixtures

Fixture Type	Estimated Flow Rate	Total Number
Toilets	1.6 gpf	33
Urinals	1.0 gpf	6
Lavatory faucets	2.2 gpm	40
Showers	2.5 gpm	8

gpf – gallons per flush
gpm – gallons per minute

Janitorial staff and employees are trained to report leaks or other maintenance problems to the facilities manager or O&M staff, which are immediately corrected.

Faucets and Showerheads

Faucets and showerheads throughout the GED facilities have been installed new, or updated to be compliant with water efficiency standards mandated in the 1992 Energy Policy Act (2.2 gallons per minute for faucets and 2.5 gallons per minute for showerheads). An inventory of sanitary fixtures is provided in Table 3.

While the existing fixtures are compliant with EPAct, The American Society of Mechanical Engineers has established a specification for lavatory faucets in public use (essentially all applications but domestic residences) with a maximum flow rate of 0.5 gpm (ASME A112.18.1) This flow rate is sufficient for hand washing and is considered a best practice for lavatory sinks in public settings.

Water pressure is maintained between 60 and 70 pounds per square inch, within the range needed for optimum system performance. Janitorial staff and employees are trained to report leaks or other maintenance problems to the facilities manager or O&M staff, which are immediately corrected.

No BMP credit is claimed in this area, pending replacement of existing faucets aerators with ones that flow at 0.5 gpm.

Boiler/Steam Systems

The GED facility does not operate a steam boiler; no BMP credit is claimed in this area.

Single-Pass Cooling

The facility has implemented an initiative to eliminate the use of single-pass cooling water. Almost all equipment in laboratory and mechanical spaces has been replaced with air-cooled units, or cooling needs are now supplied by point of use, air-cooled chiller units. The only remaining water cooled device is a single water cooled ice machine in Building 47/49. When this device reaches the end of its service life, is should be replaced with an air-cooled unit; it would not be cost effective to replace this unit based on water savings alone. BMP credit is claimed in this area as all cost effective steps to reduce or eliminate single-pass cooling water have been taken.

Cooling Tower Systems

GED operates 5 cooling towers, listed in Table 4, with a total cooling capacity of 690 tons. A cooling tower maintenance contractor performs a monthly quality, performance, and water chemistry review of cooling tower operation. Chemical treatment is provided to control scale and corrosion; treatment chemical addition rates are controlled to be proportional to the quantity of water blowdown. Conductivity meters set between 850 and 900 *u*S/cm are used to control blowdown. Historically, cooling towers were operated at between 4.5 and 5.5 cycles of concentration. The cooling tower maintenance contractor adjusted the set points up in May 2007 with a goal of achieving 6.5 cycles. This adjustment should reduce cooling tower makeup water demand by about 5 percent, a significant reduction considering the impact of cooling towers on overall facility water use.

Table 4. GED Cooling Towers

Tower Location	Rating (tons)	Makeup Water Meter
Building 20	250	No
Building 45	200	Yes
Building 47/49 #1	100	Yes
Building 47/49 #2	100	Yes
Building 65	40	Yes

All but one of the cooling towers are equipped with make-up water meters. As a check on system performance, meter readings will be recorded on a monthly basis, and water use trends evaluated by the O&M contractor and facilities manager. Unexpected trends in cooling tower water use will be investigated and resolved.

Best Management Practices related to cooling tower control have been implemented and the cooling towers will be operated at 6.5 cycles of concentration or better.

Miscellaneous High Water-Using Processes

GED conducts marine life toxicity testing, with associated marine life culturing activity. Testing is conducted across a range of salinities. Seawater is obtained from Pensacola Bay with approximately 30 parts per thousand (ppt) salinity. In general, the seawater is blended with potable, fresh water at approximately 0 ppt to achieve a mixed water with approximately 18 to 22 ppt salinity. This mixed water is used for experimental purposes. Fresh water use for this purpose is governed by experimental requirements.

GED operates three steam sterilizers. Two of the three have been replaced by new units that only apply tempering water when condensate is being discharged to the drain. The third is an older unit that discharges tempering water when the autoclave is turned on; however, operational controls have been instituted for this unit (as well as the others) so that the unit is only turned on when actually in use, sterilizing loads at 75 percent capacity or greater.

GED briefly used a reverse osmosis system to generate laboratory grade water. However, the laboratory staff has concluded that deionized (DI) water generated by ion exchange is more suitable, and now uses that technology. There is not a wastewater (or reject) stream from the DI system.

BMP credit is claimed in this area as laboratory water use is carefully controlled on a ongoing basis through implementation of the EMS.

Water Reuse and Recycling

GED is current constructing a new building, Building 67, to house its GIS and IT Center. GED is pursuing LEED certification for this project, and will install a rainwater capture and reuse system as part of the initial building design. Rainwater captured in a cistern will be used for toilet flushing. BMP credit will be achieved in this area once the collection and reuse system is operational.

7.0 DROUGHT CONTINGENCY PLAN

In the event of a drought or other water supply shortage, GED will follow the water use recommendations and restrictions of the Northwest Florida Water Management District found at: http://www.nwfwmd.state.fl.us/

The District will issue a water shortage order when appropriate and will issue associated orders depending on the level of water shortage. The orders are based on a water shortage plan enacted in March 1992. Emerald Coast Utilities Authority can also post recommendations and restrictions separate from Northwest Florida Water Management District if they deem necessary. Restrictions potentially applicable to the GED laboratory are listed below:

Phase I: Moderate Water Shortage and Phase II: Severe Water Shortage

- Voluntary reduction in water use by 15% is encouraged.

- Irrigation of established landscape at locations with odd numbered addresses is restricted to the hours of 12:00 a.m. to 8:00 a.m. on Monday, Wednesday, and Saturday; even numbered addresses or with no address is restricted to the hours of 12:00 a.m. to 8:00 a.m. on Tuesday, Thursday, and Sunday.

- Washing or cleaning of streets, driveways, sidewalks, and other impervious surfaces is prohibited, except to meet federal, state or local health or safety standards.

- Non-commercial vehicle and mobile equipment washing is allowed on pervious surfaces only, during landscape irrigation hours, by low volume methods only.

- Rinsing of boats and flushing of boat engines after use shall be limited to ten minutes a day.

Phase III: Extreme Water Shortage

- Voluntary reduction in water use by 30% is encouraged.

- Other restrictions, listed above, also apply.

8.0 COMPREHENSIVE PLANNING

The facilities manager will ensure that water supply, wastewater generation, and water efficiency BMPs are taken into account during the initial stages of planning and design for any facility renovations or new construction. These factors will also be considered prior to the purchase and installation of any equipment that would measurably change facility water consumption.

9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

GED is implementing or considering the following projects to achieve additional reductions in water use:

1) **Install and monitor make-up and blow down flow meters on all cooling towers.** The cooling towers are the most significant consumers of water at the GED laboratory. Make-up meters are currently installed on four of the five towers. A make-up water meter should also be installed on the Building 20 tower. Cooling tower water utilization data should be recorded and evaluated monthly to ensure good cooling tower performance.

   GED also should consider installing blow down water meters as this could allow the laboratory to pursue a sewer charge deduction from Emerald Coast Utilities Authority for cooling tower evaporation, which is the major cooling tower water use. Make-up water minus blow down water provides the quantity of water evaporated. Metering make-up water and blow down water would document this quantity for potential credit. Evaporated water is estimated to be about 7,000,000 gallons per year, for which GED is currently paying approximately $35,000 per year in sewer charges. This deduct might be offset by the laboratory being asked

to pay sewer charges on the seawater used in the marine toxicology laboratory that is ultimately discharged to sewer. However, the seawater quantity is estimated to be between 100,000 to 200,000 gallons per year, or almost insignificant in comparison. Make-up and blowdown meters could be installed for approximately $450 each. Payback would be less than one year if a deduction in sewer use charges can be achieved.

2) **Closely monitor cooling tower cycles of concentration.** Coordinate with the cooling tower maintenance contractor to maintain cycles of concentration at 6.5 or above. Increasing cycles from 5 to 6.5 should reduce cooling tower water use by about 5 percent, or 440,000 gallons, resulting in $3,500 in water and sewer cost savings.

3) **Install 0.5 gpm faucet aerators on bathroom sinks.** High efficiency faucet aerators can be purchased and installed for less than $5 each, for a total cost of less than $200. Projected savings are estimated to be 110,000 gallons and $900 per year, for a payback in less than one year. Verify that bathroom faucets in Building 67 are specified at 0.5 gpm.

4) **Evaluate air handler condensate recovery system on Building 67.** Consider incorporating an air handler condensate recovery system as part of the rainwater harvesting system being installed at Building 67. The facility is located in a warm, humid climate where significant quantities of cold, clean condensate will be generated when cooling loads are the greatest. Recovered condensate could be reused as cooling tower make-up water. Such a system could be cost effective if it can be incorporated in the design prior to construction (Similar systems installed as retrofits at other EPA laboratories cost approximately $10,000; incorporating this system during initial construction could result in significant cost savings). Potable water use reduction of 100,000 gallons per year or more may be possible.

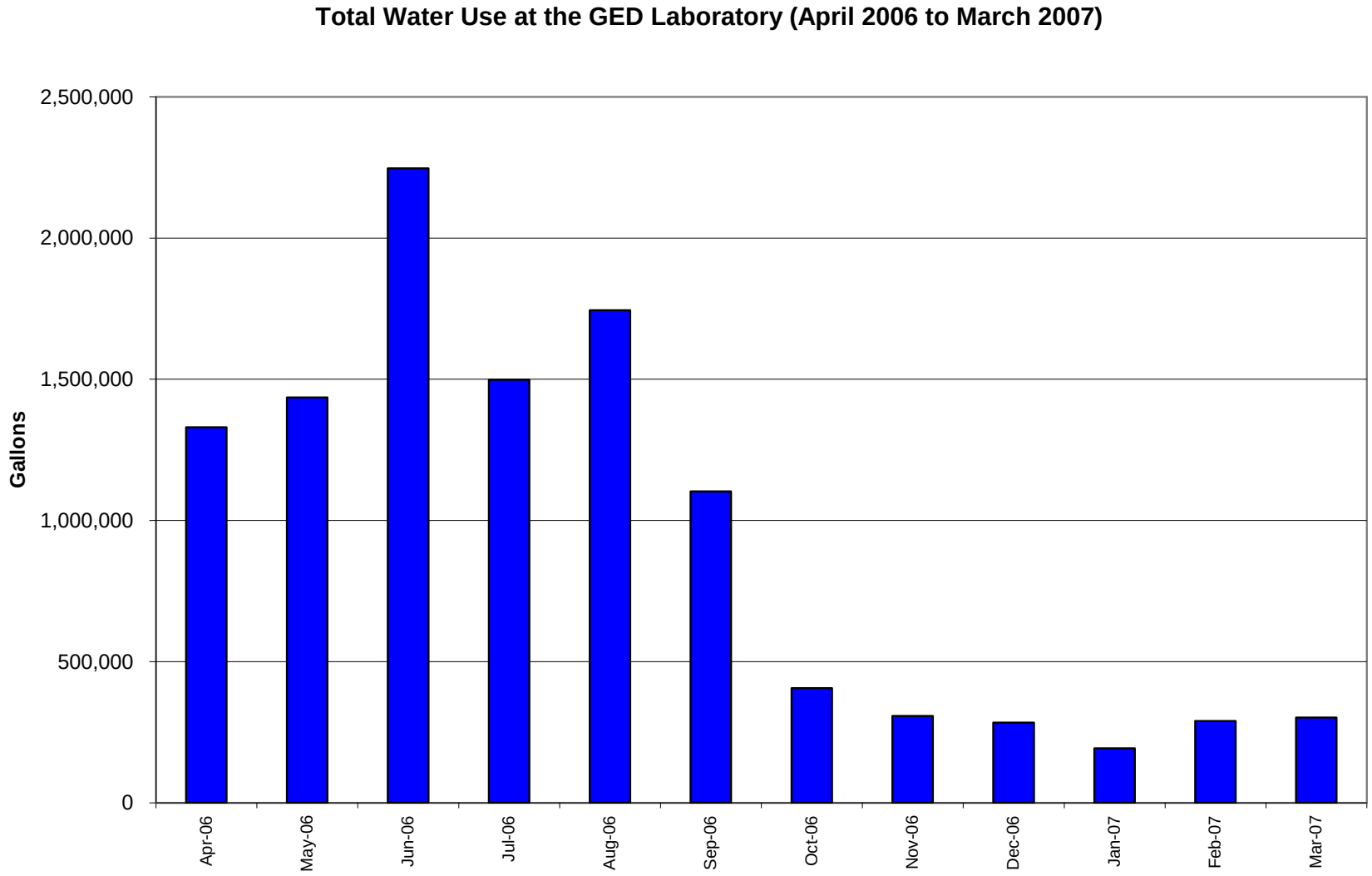
5) **Maintain appropriate nozzles on all washdown hoses.** As a best practice, maintain appropriate nozzles on all washdown hoses used for boats, equipment, and the seawater systems. High velocity, low flow nozzles are the most water conserving.

Appendix A

WATER USE AND WATER BALANCE SUPPORTING CALCULATIONS

Gulf Ecology Division
Water Balance Supporting Calculations
Based on Water use Data from April 2006 to March 2007

Major Process	Annual Consumption (gallons)	Supporting Calculations
Wet lab - marine culture and marine toxicity testing water (potable water)	70,000	Metered discharge for June 2006 to May 2007 was 104,156 gallons. This represents approximately half the total discharge, as discharge of fish culture water is not metered. Total discharge is 104,156 * 2 = 208,312 gallons. Based on salinity measures this total is approximately 2/3 seawater and 1/3 freshwater. 208,312 * 1/3 = 69,437 gallons.
Seawater system washdown	70,000	1 ½ inch fire hose estimated at 45 gpm * 30 minutes *52 weeks per year = 70,200
Fire control system testing	670,000	Fire hydrant testing: 5 hydrants * 700 gpm * 4 minutes * 4 times per year = 56,000 gallons Fire booster pump testing: Pump test is typically run for 2 minutes, but for about a 6 month period pump test was run for 15 minutes. Staff have now been trained to run for 2 minutes. 2 pumps * 700 gpm * 15 minutes * 26 times = 546,000 2 pumps * 700 gpm * 2 minutes * 26 times = 72,800 Total: 56,000 + 546,000 + 72,800 = 674,800 gallons
Sanitary water	510,000	Engineering estimate based on 135 people using 15 gallons/day, 250 days per year. 135 * 15 * 250 = 506,250 gallons.
Cooling tower make-up	8,800,000	Engineering estimate based on seasonal use patterns. While there is some cooling load all year – assume low end monthly use represents little to no cooling load. January 2007 water use was 193,125 gallons. Projecting this out over the year gives 193,125 * 12 = 2,317,500 gallons non-cooling tower use. Cooling tower use is therefore 11,143,500 (metered total) – 2,317,500 gallons = 8,826,000 gallons.
Miscellaneous laboratory water use	1,023,500	Calculated by difference from the main meter. 11,143,500 – 70,000 – 70,000 – 670,000 – 510,000 – 8,800,000 = 1,023,500 gallons
TOTAL	11,143,500	**Metered usage, April 2006 to March 2007**


Total Water Use at the GED Laboratory (April 2006 to March 2007)
Gallons
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Apr-06
May-06
Jun-06
Jul-06
Aug-06
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07

Water Use at the GED Laboratory
April 2006 to March 2007

Month-Year	Meter #1 (gallons)	Meter #2 (gallons)	Total (gallons)
Apr-06	255,000	1,075,500	1,330,500
May-06	922,500	513,375	1,435,875
Jun-06	1,665,000	582,000	2,247,000
Jul-06	1,061,250	436,875	1,498,125
Aug-06	1,158,750	585,750	1,744,500
Sep-06	641,250	462,000	1,103,250
Oct-06	138,750	267,750	406,500
Nov-06	142,500	165,000	307,500
Dec-06	168,750	115,875	284,625
Jan-07	82,500	110,625	193,125
Feb-07	138,750	151,500	290,250
Mar-07	93,750	208,500	302,250
TOTAL	**6,468,750**	**4,674,750**	**11,143,500**